TIF-29339 Patent Amendment

REMARKS

This application has been carefully reviewed in light of the Office Action dated June 16, 2005. Applicant has amended claims 1, 5, 6, 12, 16, and 17. Reconsideration and favorable action in this case are respectfully requested.

The Examiner has rejected claims 1-8, 10-19 and 21- 22 under 35 U.S.C. §103(a) as being unpatentable over EP No. 0683451A2 to Sunakawa et al in view of U.S. Pat. No. 5,894,579 to Fujihara. Applicants have reviewed these references in detail and do not believe that they disclose or make obvious the invention as claimed.

Applicants note with appreciation that the Examiner has indicated that claims 9 and 20 are allowable if rewritten in independent form.

It is unclear whether claims 23 and 24 have been rejected or are allowed. Claims 23 and 24 were added to have independent claims with a restriction that task allocation scenarios were generated using information regarding possible degradations associated with one or more of the tasks in a task list. These claims are similar, but not identical, to claims 9 and 20 that have been indicated as allowable. In paragraph 3 and again in paragraph 5 of the Office Action, only claims 1-8, 10-19 and 21-22 are rejected. Yet in 14 and 15, the claims are rejected. Clarification on this issue is needed.

Applicants must respectfully disagree with the Examiner's conclusion regarding the remaining claims. Sunakawa provides six embodiments for reducing power, these embodiments have been discussed in detail in connection with the previous Responses:

Sunakawa Embodiment	Description
1	A task which uses one or more devices with the largest power

	consumption is given a higher priority in order to complete the task in a shorter period of time. When multiple tasks are being executed, the higher priority task is provided with more execution cycles relative to the other tasks (page 10, lines 8-30).
2	If initiating a device pursuant to a task would exceed power limits, the task is delayed (page 12, lines 1-5)
3	Increased power due to a device's transition from a high-power mode to a low-power mode is taken into consideration deciding upon whether to place the device in a low power mode once a task's access to a device is complete (page 15, lines 1-5)
4	The hysteresis of intervals between accesses to the device is recorded (and averaged). This information is used in the determination of whether a device should transition to a low-power mode after the end of an access (page 15, lines 8-25)
5	The transition of a hard disk drive is made with consideration of whether virtual memory is on or off (page 15, lines 29-40)
6	A transition to a low power mode is made in consideration of a delay time associated with returning to a high power mode (page 15, lines 44-57)

None of the embodiments listed above include either (1) calculating consumption information for *a plurality of scenarios for executing a plurality of tasks scheduled for concurrent execution*, the consumption information of each scenario based on probabilistic values for activities associated with the tasks or (2) executing the tasks *according to a selected one of the plurality of scenarios* on said plurality of processing modules responsive to said consumption information. With regard to the first step, in Sunakawa, a decision of how tasks are executed is not based on calculating consumption

information for a *plurality of* scenarios for executing a plurality of tasks to be performed concurrently. In the embodiment of Sunakawa cited the Examiner, a decision to give a higher priority to a certain task is based upon the power consumed by the task *solely according to a calculation of the total power consumed by devices accessed by the task.* Not even a single scenario is calculated; a higher-consuming task is given more execution cycles than a lower-consuming task without any calculation regarding whether the increased execution cycles will provide a benefit – the benefit is simply assumed.

Fujihara adds little, if anything, to the Sunakawa reference. In Fujihara, requests to access a device are made to a FIFO (first-in-first out) queue. If a pending request would result in a total power consumption (Pnow) in excess of a predetermined power consumption threshold (Pmax), then the access request is delayed at least until a currently executed access request is completed. After a currently executed access request is completed, the pending request is reevaluated (Figure 6 and column 4, lines 40-61). The disclosure in Fujihara is essentially the same as the second embodiment of Sunakawa.

In the Examiner's Response to Arguments section, the Examiner indicates that the restriction of the generation of multiple scenarios for executing the tasks from which one task is chosen is not recited in the claims. Applicants disagree, but to further prosecution of the present application, independent claims 1 and 12 have been amended so that no doubt remains.

Neither Sunakawa nor Fujihara teaches the generation of multiple scenarios for executing the tasks from which one scenario is chosen. Sunakawa merely shows modifying task execution based on a single criterion. Fujihara shows a real-time decision to grant access to a device based on whether such access would result in excessive power consumption.

Accordingly, Applicants respectfully request allowance of claims 1 and 12.

With regard to claim 3, the Examiner states (in the Response to Arguments section) that:

> In response to argument (2), Sunakawa explicitly teaches that "heat causes operation errors ... and deteriorates the reliability of the apparatus." Sunakawa further explicitly teaches that it is therefore "important to reduce consumption power to suppress heat generation." Because one of the primary goals of Sunakawa system is to minimize heat generation, it is absurd to believe that the system would all ignore thermal constraints and compromise the reliability of the system by allowing it to overheat. Therefore it is obvious that when the Sunakawa system operates (i.e. executing the tasks according to a selected scenario) the system is maintained within particular thermal constraints in order to avoid the problems stated above.

This line of argument completely distorts the subject matter of claim 3 and the Applicants arguments in support thereof. Specifically, Applicant stated:

> With regard to claim 3, neither Sunakawa nor Fujihara show the step of executing the tasks on said plurality of processing according to a scenario that provides the maximum performance within thermal constraints associated with the processing system. While the Examiner cites a passage specifying that it is a goal to reduce heat, there is no teaching in either reference that a scenario is chosen based on thermal constraints.

The contention that Applicants suggested Sunakawa would "would all ignore thermal constraints and compromise the reliability of the system by allowing it to overheat" is completely unsupported by the record. In claim 3, the executing step comprises the step of "executing the tasks on said plurality of processing modules *according to the scenario that provides the maximum performance within thermal constraints* associated with the processing system." There is nothing to suggest that Sunakawa takes maximum performance into account in any of the embodiments listed above. Sunakawa is directed to avoiding situations where power requirements would exceed limits – not finding a scenario that maximizes performance within those limits.

Furthermore, the Examiner's statement that "it is obvious that when the Sunakawa system operates (i.e. executing the tasks according to a selected scenario) the system is maintained within particular thermal constraints in order to avoid the problems stated above" is unsupported. Sunakawa, and one would suspect others before him, identified heat as a problem in electronic circuits. Identifying a problem and completely resolving the problem are two different things. Sunakawa does not eliminate the problem of heat, it tries to avoid it by simplistic measures which no longer are sufficient for avoiding heat in a dense multiprocessor system.

With regard to claim 4, Sunakawa does not execute tasks according to one scenario from a plurality of scenarios that provides the lowest possible energy consumption. Since Sunakawa does not generate multiple scenarios and calculate the energy consumption for each scenario, it could not possibly choose the scenario with the lowest energy consumption.

With regard to claim 13, the Examiner states that "Sunakawa explicitly teaches using counters to measure activity of the devices [page 7 lines 22-30]. Because a timer *counts* an elapsed time, the timer is interpreted as a counter." Claim 13 recites counters for measuring activity occurrences and wherein said power management function further monitors said counters and modifies the execution of the tasks based on values in said counters. The timers referred to by the Examiner are not used for measuring activity of the devices, they are used to switch a unit to low power mode once it has been idle for a set period of time. The execution of the tasks in Sunakawa is not modified by the values in the timers.

Applicants sincerely believe that the present invention is directed to an entirely different subject matter than the Sunakawa and Fujihara references. The present invention constructs and evaluates different scenarios for executing tasks in order to meet predefined criteria. Sunakawa compares task power consumption and raises priority

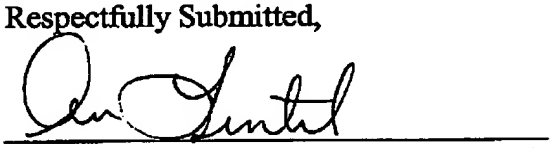
accordingly. Fujihara evaluates the ability of the system to accommodate a pending access request. While the goals of the references may be similar in some cases, the way in which the goals are attained is significantly different. Accordingly, Applicant respectfully requests allowance of claims 1-24.

The Commissioner is hereby authorized to charge any fees or credit any overpayment, including extension fees, to Deposit Account No. 20-0668 of Texas Instruments Incorporated.

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Alan W. Lintel, Applicants' Attorney at (972) 664-9595 so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,



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